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ABSTRACT

Research resulting in the development of the Specific Aptitude Test Battery for use in selecting inexperienced or untrained individuals for training as Utility Hands (paper goods) was described. Aptitudes measured were form perception, clerical perception, and manual dexterity. Job analysis was performed by observation of the workers' performance on the job and in consultation with the workers' supervisors. A descriptive rating was used which consisted of seven items: (1) quantity of work, (2) quality of work, (3) accuracy of work, (4) job knowledge, (5) facility for work, (6) job versatility, and (7) all-around job ability. Statistical analysis of ratings were used to determine which aptitudes should be considered for inclusion in the battery. The objective was to develop a battery of 2, 3, or 4 aptitudes with cutting scores at five point intervals at the point where about the same percent will meet the cutting scores as the percent placed in the high criterion group and which will maximize the relationship between the battery and the criterion. Appended was a list of organizations cooperating in the study, a descriptive rating scale, and a description of job duties. (BJG)

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ED117132

Technical Report on Development of USES Specific Aptitude Test Battery

For

Utility Hand (paper goods) 539.883

S-466

Developed in Cooperation with the
Arkansas, California, Kentucky, South Carolina and Pennsylvania
State Employment Services

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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1975

Development of USES Specific Aptitude Test Battery S-466

For

Utility Hand (paper goods) 539.883

RESEARCH SUMMARY

This report describes the research which resulted in the development of the following Specific Aptitude Test Battery for use in selecting inexperienced or untrained individuals for training as Utility Hands:

Aptitudes	Cutting Scores
P - Form Perception	85
Q - Clerical Perception	95
M - Manual Dexterity	70

Sample:
78 Utility Hands (11 females and 67 males) employed in various companies (see Appendix 1). A total of 19 were minority group members (12 Blacks, 5 Spanish Surnamed, 1 Aleut and 1 French Canadian) and 59 were nonminority group members.

Criterion:
Supervisory ratings. Criterion data were collected during 1972, 1973 and 1974.

Design:
Concurrent (test and criterion data were collected at about the same time).

Validity:
Phi coefficient for total sample = .36 ($P/2 < .005$)

Comparison of Minority and Nonminority Groups:
It was not technically feasible to compare the validity of the battery for minority and nonminority groups as it was not possible to obtain data on a sufficient number of minority group workers to permit separate data analysis for minority and nonminority groups.

JOB ANALYSIS

Job analysis was performed by observation of the workers' performance on the job and in consultation with the workers' supervisors. On the basis of the job analysis, the job description shown in Appendix 3 was prepared. The job description was used to (1) select experimental samples of workers who were performing the job duties; (2) choose appropriate criteria or measures of job performance; (3) determine which aptitudes are critical, important or irrelevant to job performance (see Tables 1 and 4); and (4) provide information on the applicability of the test battery resulting from this research.

TABLE 1

Qualitative Analysis

Aptitude	Rationale
P - Form Perception	Required to install flanges and center shaft in rolls of paper.
Q - Clerical Perception	Required to read scales accurately, to record weights, and to select properly marked materials to convey to the operators.
K - Motor Coordination	Required to use broom, shovel and scraper, to operate fork lift truck, and to use forced air hose.
M - Manual Dexterity	Required to lift and handle waste containers, to use hammer to install center shaft and flanges in roll of paper.

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002B, were administered.

CRITERION

The immediate supervisor rated each worker. The ratings were obtained by means of personal visits of State test development analysts who explained the rating procedure to the supervisors. Two ratings were obtained from each supervisor with an interval of at least two weeks between the ratings. Since sample members' test scores are confidential, supervisors had no knowledge of the test scores of workers.

A descriptive rating scale was used. The scale (see Appendix 2) consists of seven items. Six of these items cover different aspects of job performance. The seventh item is a global item on the Utility Hand's "all-around" ability. Each item has five alternative responses corresponding to different degrees of job proficiency. For the purpose of scoring the items, weights of 1 to 5 were assigned to the responses. The total score on the rating scale is the sum of the weights for the seven items. The possible range for each rating is 7-35.

A review of the job description indicated that the subjects covered by the rating scale were directly related to important aspects of job performance.

A - Quantity of work: Materials must be supplied and removed in a timely manner in order to avoid delays and down time.

B - Quality of work: Work areas must be kept neat and clean in order to avoid hazardous conditions.

C - Accuracy of work: Correct materials must be available in order to avoid delays and down time.

D - Job knowledge: The worker must have sufficient knowledge to provide appropriate materials to the machine operator.

E - Facility for work: Utility Hands perform a variety of job duties and must learn new tasks quickly.

F - Job versatility: Utility Hands are required to perform a variety of job duties.

G - "All-around" job ability: Utility Hands' value to the employer involves a combination of aspects of job performance listed above.

A reliability coefficient of .84 was obtained between the initial ratings and the reratings, indicating a significant relationship. Therefore, the scores of the two ratings were combined. A correlation of .40 between experience and the combined criterion was observed, which indicates that a considerable amount of the variance in the combined criterion is related to variance in amount of job experience. Therefore, an adjusted criterion score was used as the final criterion which was computed as follows: An estimated criterion score was computed using the usual regression equation:

$$Y' = bX + a$$

where

Y = observed criterion score
Y' = estimated criterion score
X = months of experience

$$b = r_{XY} \frac{SD_Y}{SD_X}$$

$$a = Mean_Y - (Mean_X)b$$

This estimated criterion score was subtracted from the observed criterion score. A constant of 50 was added to avoid negative numbers and the result truncated to a whole number.

This adjustment has the effect of removing from the criterion that part of its variance which is predictable from knowledge of amount of experience. This is appropriate as the battery will be used to predict job performance of inexperienced workers. The mean of the final criterion is 49.5 with a standard deviation of 8.1. The relationship between the final criterion and age, education and job experience is shown in Table 2.

TABLE 2

Means, Standard Deviations (SD) and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience

	Mean	SD	r	Range
Age (years)	26.8	9.2	.12	18-53
Education (years)	11.5	1.4	.04	7-14
Experience (months on current job)	21.3	23.6	.01	2-128

About one-third of the workers are considered to be marginal workers. Therefore, the criterion distribution was dichotomized so as to include about one-third of the sample in the low criterion group and the remainder in the high criterion group. The criterion cutting score was set at 46 which places 33% in the low criterion group and 67% in the high criterion group.

SAMPLE

The sample consisted of 78 Utility Hands (11 females and 67 males) employed in various companies (see Appendix 1). A total of 19 were minority group members (12 Blacks, 5 Spanish Surnamed, 1 Aleut, and 1 French Canadian) and 59 were nonminority group members. The means and standard deviations for age, education and experience of the sample members are shown in Table 2. All workers had at least 2 months of experience in their current job and none were test-selected.

STATISTICAL RESULTS

TABLE 3

Statistical Results

N=78

Aptitude	Mean	SD	r	Range
G - General Learning Ability	89.9	17.3	.17	51-138
V - Verbal Aptitude	90.4	14.1	.12	65-127
N - Numerical Aptitude	89.0	17.5	.18	52-128
S - Spatial Aptitude	96.2	20.9	.11	55-147
P - Form Perception	104.4	22.0	.20	39-149
Q - Clerical Perception	105.1	14.4	.25*	69-138
K - Motor Coordination	99.8	17.5	.14	55-138
F - Finger Dexterity	95.4	23.5	.10	27-149
M - Manual Dexterity	102.4	20.2	.21	35-140

* Significant at the .05 level

Table 4 summarizes the qualitative analysis and statistical results shown in Tables 1 and 3 and shows the aptitudes considered for inclusion in the battery.

TABLE 4

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
"Critical" on Basis of Job Analysis									
"Important" on Basis of Job Analysis					X	X	X		X
"Irrelevant" on Basis of Job Analysis									
Relatively High Mean					X	X			X
Relatively Low Standard Deviation		X				X			
Significant Correlation with Criterion						X			
Aptitudes Considered for Inclusion in the Battery					P	Q			M

The information in Table 4 indicates that the following aptitudes should be considered for inclusion in the battery: P, Q, and M. The objective is to develop a battery of 2, 3 or 4 aptitudes with cutting scores set at five point intervals at the point (a) where about the same percent will meet the cutting scores as the percent placed in the high criterion group and (b) which will maximize the relationship between the battery and the criterion. The cutting scores are set at approximately one standard deviation below the mean aptitude scores of the sample, with deviations above or below these points to achieve the objectives indicated above.

The following battery resulted:

Aptitudes	Cutting Scores
P - Form Perception	85
Q - Clerical Perception	95
M - Manual Dexterity	70

VALIDITY OF THE BATTERY

TABLE 5

Validity of Battery

	Below Cutting Scores	Meeting Cutting Scores	Total
High Criterion Group	10	42	52
Low Criterion Group	15	11	26
Total	25	53	78

Phi coefficient = .36 (Yates' corrected)
Significance level = P/2 < .005

OCCUPATIONAL APTITUDE PATTERN

This occupation was incorporated into OAP-52 in Section II of the 1970 edition of the Manual for the USES General Aptitude Test Battery with an asterisk (*) since (1) the battery included the same aptitudes as those in the OAP, (2) the cutting scores of the aptitudes in the battery were within ten points of the cutting scores of the aptitudes in the OAP and (3) a significant phi coefficient was obtained between the criterion and the OAP-52 cutting scores of P-80, Q-90 and M-80. A phi coefficient of .20 (P/2 < .05) was obtained for this sample.

APPENDIX 1

Organizations Cooperating in the Study

American Can Company, Dixie Products Division, Fort Smith, Arkansas
American Can Company, Dixie Products Division, Anaheim, California
Owens-Illinois, Lily-Tulip Division, Riverside, California
Solo Cup Company, Santa Paula, California
Owens-Illinois, Lily-Tulip Division, Bardstown, Kentucky
American Can Company, Dixie Products Division, Lexington, Kentucky
American Can Company, Dixie Products Division, Easton, Pennsylvania
American Can Company, Dixie Products Division, Darlington, South Carolina

APPENDIX 2

UNITED STATES EMPLOYMENT SERVICE

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

SCORE_____

RATING SCALE FOR_____
D.O.T. Title and Code

Directions: Please read the "Suggestions to Raters" and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

SUGGESTIONS TO RATERS

We are asking you to rate the job performance of the people who work for you. These ratings will serve as a "yardstick" against which we can compare the test scores in this study. The ratings must give a true picture of each worker or this study will have very little value. You should try to give the most accurate ratings possible for each worker.

These ratings are strictly *confidential* and won't affect your workers in any way. Neither the ratings nor test scores of any workers will be shown to anybody in your company. We are interested only in "testing the tests." Ratings are needed only for those workers who are in the test study.

Workers who have not completed their training period, or who have not been on the job or under your supervision long enough for you to know how well they can perform this work should not be rated. Please inform the test technician about this if you are asked to rate any such workers.

In making ratings, don't let general impressions or some outstanding trait affect your judgment. Try to forget your personal feelings about the worker. Rate him only on the way he does his work. Here are some more points which might help you:

1. Please read all directions and the rating scale *thoroughly* before rating.
2. For each question compare your workers with "workers-in-general" in this job. That is, compare your workers with other workers on this job that you have known. This is very important in small plants where there are only a few workers. We want the ratings to be based on the same standard in all the plants.
3. A suggested method is to rate all workers on one question at a time. The questions ask about different abilities of the workers. A worker may be good in one ability and poor in another; for example, a very slow worker may be accurate. So rate all workers on the first question, then rate all workers on the second question, and so on.
4. Practice and experience usually improve a worker's skill. However, one worker with six months' experience may be a faster worker than another with six years' experience. Don't rate one worker as poorer than another because he has not been on the job as long.
5. Rate the workers according to the work they have done over a period of several weeks or months. Don't rate just on the basis of one "good" day, or one "bad" day or some single incident. Think in terms of each worker's usual or typical performance.
6. Rate only the abilities listed on the rating sheet. Do not let factors such as cooperativeness, ability to get along with others, promptness and honesty influence your ratings. Although these aspects of a worker are important, they are of no value for this study as a "yardstick" against which to compare aptitude test scores.

Name of worker (*print*)_____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ See him at work all the time.
- ☐ See him at work several times a day.
- ☐ See him at work several times a week.
- ☐ Seldom see him in work situation.

How long have you worked with him?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months.
- ☐ Six months or more.

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

1. ☐ Capable of very low work output. Can perform only at an unsatisfactory pace.
2. ☐ Capable of low work output. Can perform at a slow pace.
3. ☐ Capable of fair work output. Can perform at an acceptable but not fast pace.
4. ☐ Capable of high work output. Can perform at a fast pace.
5. ☐ Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

1. ☐ Performance is inferior and almost never meets minimum quality standards.
2. ☐ The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.
3. ☐ Performance is acceptable but usually not superior in quality.
4. ☐ Performance is usually superior in quality.
5. ☐ Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

1. ☐ Makes very many mistakes. Work needs constant checking.
2. ☐ Makes frequent mistakes. Work needs more checking than is desirable.
3. ☐ Makes mistakes occasionally. Work needs only normal checking.
4. ☐ Makes few mistakes. Work seldom needs checking.
5. ☐ Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

1. ☐ Has very limited knowledge. Does not know enough to do his job adequately.
2. ☐ Has little knowledge. Knows enough to "get by."
3. ☐ Has moderate amount of knowledge. Knows enough to do fair work.
4. ☐ Has broad knowledge. Knows enough to do good work.
5. ☐ Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

1. ☐ Has great difficulty doing his job. Not at all suited to this kind of work.
2. ☐ Usually has some difficulty doing his job. Not too well suited to this kind of work.
3. ☐ Does his job without too much difficulty. Fairly well suited to this kind of work.
4. ☐ Usually does his job without difficulty. Well suited to this kind of work.
5. ☐ Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

1. ☐ Cannot perform different operations adequately.
2. ☐ Can perform a limited number of different operations efficiently.
3. ☐ Can perform several different operations with reasonable efficiency.
4. ☐ Can perform many different operations efficiently.
5. ☐ Can perform an unusually large variety of different operations efficiently.

G. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around ability" to do his job.)

1. ☐ Would be better off without him. Performance usually not acceptable.
2. ☐ Of limited value to the organization. Performance somewhat inferior.
3. ☐ A fairly proficient worker. Performance generally acceptable.
4. ☐ A valuable worker. Performance is usually superior.
5. ☐ An unusually competent worker. Performance almost always top notch.

Rated by..... Title..... Date.....

Company or organization..... Location.....
(City) (State)

APPENDIX 3

Utility Hand (paper goods) 539.883

JOB DUTIES

Cleans floors, removes waste materials, installs and replaces rolls of paper, obtains supplies for machine operator, removes cartons, and assists operator as required.

*Cleans floors: Scrapes wax from floor using long handled scraper, sweeps floor using broom, shovels trash into container.

*Removes waste: Removes waste container from machine and replaces with empty container. Weighs waste and records weight. Empties container into waste bin cart.

*Installs and replaces rolls of paper: Installs center shaft and flanges in roll of paper using hammer. Pushes hand operated roll carrier to install roll in roll stand. Removes empty case from roll stand. Removes center shaft and flanges from empty core.

Obtains supplies for machine operator: Locates empty cartons in accord with production and schedule requirements. Lifts cartons onto fork lift and trucks to machine. Lifts cartons onto conveyor. Carries cartons of materials such as cup-top-protector or plastic bags to machine operator.

Removes cartons: Brushes glue on top of filled cartons and seals carton. Lifts and stacks cartons. Removes stacks of cartons using hand or power operated fork-lift truck.

Assists operator: Uses forced air hose to assist in cleaning shut down machines. Assists in lifting machine parts when necessary.

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*These job duties were designated as critical since they must be performed competently if the job is to be performed in a satisfactory manner. Utility Hands spend about 75% of their working time performing these duties.

GPO 895-816